The plants of Timor Laut are mostly *coral island* plants, but with some peculiar forms, one species belonging to the flora of New Hebrides, and one to that of Australia. Cocoanuts, ferns, clerodendra, solanums and malvaceous shrubs occur. The low shrubby forest is, in some places, almost impenetrable from its spiny character. The largest trees are fig trees (Urostigma) and stereulias. The latter is near to the fire-tree of Australia, and their crowns of bright scarlet flowers, thrown out in advance of the foliage, are very conspicuous. Leguminous trees and myrtles abound; there is a pandanus, and a few palms. A green carpet of Commelyna hides the rough coral. *Artocarpus incisa* is not uncommon. There are no casuarinas, phyllode-bearing acacias, eucalypti or melanolencas.

Lieutenant Beresford has ascended the volcano of Ambrym, in the New Hebrides. The active crater is about a quarter of a mile wide, but there is a large extinct one three or four miles across, and other smaller extinct ones. All the hills seem to be mere cinder heaps.

GEOLOGY AND PALÆONTOLOGY.

THE CHORISTODERA.—We are now indebted to Dr. Lemoine, of Reims, for a general elucidation of the European form which corresponds with the American genus Champsosaurus,[1] and which has not yet been shown to be distinct from it. The osteology is described in a pamphlet published by the author at Reims under the title, "Etude sur les Charactéres Génériques du Simædosaure, reptile nouveau de la faune Cernaysieme, etc., 1884." The results obtained by Dr. Lemoine are very interesting, and quite anticipate the information which it was hoped that American material might furnish. The results of my own studies on Champsosaurus were thus expressed in 1876.[2] "As a summary of the preceding I propose to refer the genus Champsosaurus to the order Rhynchocephalia provisionally. It differs very much from Sphenodon in the non-coössification of the sacral vertebræ and non-union of the neural arches of the vertebræ with their centra, and the absence of the chordal perforations of the latter. * * On these grounds it may constitute a distinct suborder under the name of Choristodera." Dr. Lemoine states that M. Dollo has indicated to him that the form presents affinities to Sphenodon (= Hatteria),[3] and Dr. Lemoine himself finds resemblances in the vertebræ and teeth to that genus. The results of his researches in other directions, however, compel a different conclusion as to the true position of this suborder.

[1] Cope. Proceedings Philadelphia Academy, Dec., 1876. Simædosaurus Gervais, *Journal de Zoologie*, Feb., 1877.

[2] Proceedings Phila. Academy, p. 350.

[3] Etude, p. 37.

In the first place, Lemoine shows that the genus is streptostylicate, and that the quadrate bone has much the character of that of the Pythonomorpha. It can, therefore, only be properly compared with that order, the Lacertilia and the Ophidia. The single rib-heads and the separate odontoid bone are entirely confirmatory of this affinity. There is therefore no longer any propriety in comparing it with the Rhynchocephalia or the Crocodilia. Is it a Lacertilian or a Pythonomorph, or to what division of the streptostylicates is it to be referred?

Dr. Lemoine has discovered what he regards as a distinct cranial segment ("vertebra") interposed between the occipital and parietal segments in this genus. This is very remarkable, and constitutes a strong mark of distinction between the Choristodera and Lacertilia. It will depend on future investigations to show whether such difference exists between this order and the Pythonomorpha and Ophidia. In this question everything depends on the interpretation of the pieces. The new segment consists, according to Lemoine, of an "anterior basioccipital" as axis, which is surmounted by the opisthotic, and this by the epiotic on each side. It is closed above by the supraöccipital (Etude, p. 14). The segment in front of this Lemoine identifies with the sphenoidal. Its axis, then, becomes the sphenoid bone, and its lateral pieces the proötics. According to Lemoine's figure six, the latter elements meet on the middle line above, and the pariëtal lies above them. A notch on the lower part of the front margin of the so-called proötic is identified with the foramen of the trigeminal nerve.

Without access to similar specimens it is impossible to know whether any of the axial pieces of this skull is a parasphenoid or not. In any case we shall learn something by comparison with the snake and pythonomorph skull. Each of these, as is well known, presents a decurvature in front of the proötic bone, which reaches to the sphenoid or presphenoid. The foramen of the fifth nerve is posterior to this, in the position of the one assigned by Lemoine to the eighth nerve. If now we identify Lemoine's proötic with the lateral or "alisphenoid" plate of the pariëtal segment of the above orders, we have the normal number of cranial segments remaining. The "opisthotic" (fig. 4) becomes proötic, and the "anterior basioccipital" becomes sphenoid. This is the more probable identification, because in the streptostylicate reptiles, the opisthotic is largely or entirely excluded from the cranial walls, and becomes part of the suspensorium of the quadrate. Moreover, many of the Lacertilia possess ossifications of the anterior membranous wall of the brain-case in front of the true proötic, which nearly meet on the middle line above, in the manner of the anterior elements described by Lemoine.

To the resemblance which this structure bears to that of the Ophidia must be added the absence of true roots of the teeth.

These points, together with the natatory limbs, indicate that the position of this group is with the order or suborder Pythonomorpha. The characters which distinguish it are, the distinctness of the anterior pieces, which may be called, for the present, alisphenoids; the amphiplatyan vertebræ, and the presence of condyles of the phalanges. The Choristodera will be distinguished by these characters wherever placed.

The dentition is remarkably like that of the bony gar, Lepidosteus, and Dr. Lemoine has enabled me to identify specimens as to whose place I have hitherto been greatly puzzled.—*E. D. Cope.*

THE FORMATION OF STATUARY MARBLE.—From numerous experiments conducted separately by MM. Berthelot, Bonssingault and Dieulafait, it appears that the chalk must be very rich in manganese. Fifty-six examples from the chalk of the Paris basin, operated upon last year, gave this result without exception, and twenty examples from England and various parts of Europe, have since then yielded the same results in the hands of M. Dieulafait. The presence of manganese was evident in half a gramme of chalk. Manganese is also found in a state of complete diffusion in the marbles of Carrara, Paros and the Pyrenees. Important geological consequences result from the discovery. Even as low as the lower gneiss, limestones exist, often arranged in concentric layers like the coats of an onion, whence they are called "cipolin" marbles. In some places these marbles form considerable masses and can be exploited, but more frequently occur in isolated lenticular masses, often ending in thin streaks which become lost in the enclosing rock. This arrangement proves that the cipolins are cotemporaneous with the rocks enclosing them. The examination of samples of the rocks from almost every part of Europe and from the United States, has shown manganese to be present in such quantities that it is perceptible in half a gramme, or, in at least half the cases, in a few centigrammes of the rock.

Guided by the idea, derived from chemistry, that when carbonate of lime is in presence of a salt of iron and a salt of manganese, the iron will be precipitated almost pure, while the greater part of the manganese will remain in solution, M. Dieulafait thus explains the geological process. The magma of gneiss was composed principally of silicate of lime and alumina, with a considerable quantity of lime and a sensible proportion of iron and manganese. Water circulating throughout this mass would dissolve the lime and manganese and leave the iron, and the carbonate of lime, thus freed from the greater portion of the iron would be of that clear white suitable for statuary marble, and would be deposited in concentric layers in the midst of the highly colored gneissic rocks.

THE GENUS PLEURACANTHUS.—In the AMERICAN NATURALIST for April, 1884, p. 413, I gave a brief abstract of the characters of the skull of Didymodus, and proposed to regard it as the type of a new order to be called the Ichthyotomi. I now give a plate of the skull of *D. compressus* and *D. platypterus*, sp. nov.—*E. D. Cope.*

EXPLANATION OF PLATE XXIII.

(I owe this plate to the American Philosophical Society, who will publish it in the forthcoming number of their Proceedings.)

All the figures two-thirds natural size except fig. 5, which is one-half larger than nature.

FIG. 1.—Skull from above, right frontal bone displaced and its anterior extremity broken off. Posterior apex broken from right frontal cartilage bone. *a*, frontal or supraorbital bone, that of the right side displaced; *b*, anterior nostril; *c*, postfrontal facet for palatopterygoid; *d*, frontal fissure.

FIG. 2.—Posterior part of skull of another individual, from above; *a*, occipital bone; *b*, parietal; *c*, cornua of frontal bone.

FIG. 3.—Anterior view of fig. 2, displaying section of brain case; *a*, frontal or parietal cartilage bone; *b*, sphenoid; *c*, brain cavity; *d*, frontoparietal fontanelle; *e*, hyomandibular condyle (? pterotic bone).

FIG. 4.—Anterior part of skull, from below, of a third individual, displaying orbits and postorbital processes.

FIG. 5.—Tooth of *Didymodus compressus* Newb., natural size, posterior view.

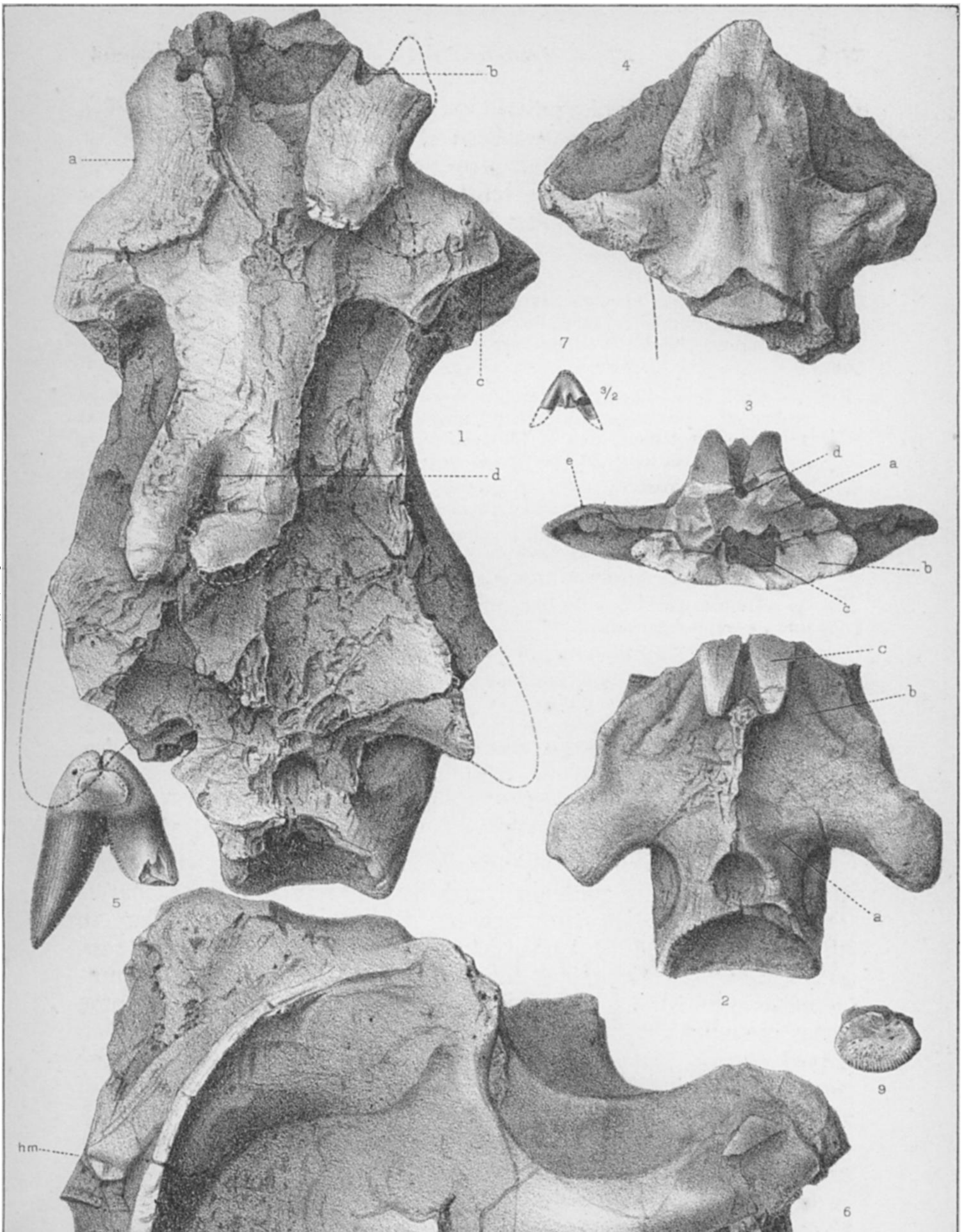
FIG. 6.—Palatopterygoid and mandibular arches of a fourth individual, from right side, with *hm*, hyomandibular.

FIG. 7.—Superior tooth of external row, without apices of two of the cusps; from the palatine bone of the specimen represented in fig. 5; one-half larger than nature, anterior view.

FIG. 8.—Tooth of *Didymodus platypternus* Cope, nat. size, from above posteriorly.

FIG. 9.—Tooth of a second specimen of *Didymodus platypternus*, from below.

ORIGIN OF CORAL REEFS.—Professor A. Geikie sums up a considerable amount of evidence which has accumulated since Charles Darwin's theory on this subject was put forth, tending to show that the theory (essentially that of growth of coral in connection with subsidence of the sea bottom) is by no means universally applicable. Semper and Rein supposed that in some cases raised masses of sand or deep-water corals are formed which afford resting places for surface-growing corals; the form of the islands, Semper held, is caused by the death of the inner parts of the colonies of corals, and by the action of the tides. Mr. J. Murray, from observations made on the *Challenger*, considers that volcanic cones, such as form most oceanic islands, tend to be reduced to submerged banks by the action of the waves; also, that the raising of the sea-bottom to such a height as to favor the growth of corals, is due to the unusually rapid accumulation near the shore of calcareous débris derived from dead pelagic organisms. These are so abundant as probably to represent upwards of sixteen tons of carbonate of lime in suspension in the uppermost one hundred fathoms of every square mile of the ocean. In the deepest water these appear to be dissolved before reaching the bottom, but they accumulate on shallow bottoms, and thus furnish



T. Sinclair & Son Lith. Phila.

SKULL OF DIDYMODUS.

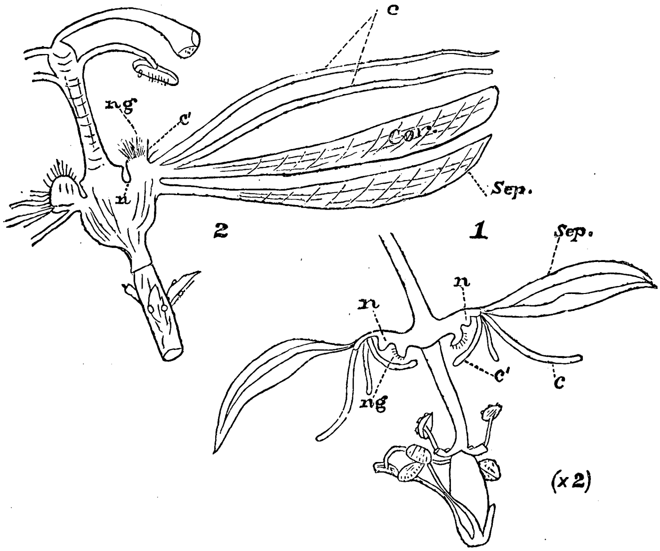
foothold for sponges, various cœlenterates, &c., which in return die and bring up the bottom to the level of reef coral growth. This, taking place on a submerged bank,would produce the atoll-form of island, which would tend to widen by death inside, and by the consequent solution of the dead coral by the carbonic acid of the sea-water. Special cases, such as elongate chains of atolls, *e. g.*, the maldives, or submerged banks, as the chagos, fall in with the theory. Barrier reefs are similarly explained as due primarily to growth upon accumulations of débris around land.—*Journ. Roy. Microscopical Society, April.*

GEOLOGICAL NEWS.—*Carboniferous.*—Dr. R. H. Traquair (*Geol. Mag.*, Feb.) describes *Aganacanthus striatulus* from selachian spines found in the Blackband ironstone of Borough Lee, near Edinburgh.——In the January number of the same magazine, Dr. Traquair describes *Ctenacanthus costellatus*, a shark from the Lower Carboniferous rocks of Eskdale, Dumfriesshire. It appears to be a Cladodont. In the same issue Dr. Traquair describes *Elonichthys ortholepis*, a ganoid fish from the Lower Carboniferous of Eskdale, Dumfriesshire.—— Mr. J. Young notes upon the hinge line of *Spirifera trigonalis*, a denticulated structure like that upon the hinge line of Arca. He regards these denticles as originally formed of aragonite, which is harder than calcite. In the fossils, however, the aragonite has decayed, and has been replaced by a coarser calcite (*Geol. Mag.*, Jan.).——At a recent meeting of the London Geological Society, J. W. Davis described the fishes from the Yoredale series at Leyburn. Of the thirty-four species twenty are identified with known Carboniferous limestone forms, one, *Megalichthys hibberti*, is a coal-measure species, while the remaining thirteen are described as new. Eight of these are regarded as types of new genera.——Dr. E. Tietze (Jahrb. Kais. Kon. Geol. Reichanstalt, 1884), contributes an extensive account of the geology of Montenegro. Twenty-three peaks rise to elevations varying from 2000 to 2500 meters. All the principal formations from the palæozoic to the quaternary can be identified with tolerable certainty, but their members are not so well made out. The palæozoic strata consist largely of black or quaternary strata, occur east of Dulcigno, east and north of the Scutarie-see, and at various isolated points. Marine neogene strata are only found between Dulcigno and the coast, and fresh-water strata of similar age do not enter the boundaries of the little principality. The various tertiary strata are grouped along the Adriatic shore, and include nummulitic beds. The Cretaceous strata occupy the largest area, while in the north the Trias is largely developed.——Among the most recent of the memoirs of the Museum of Comparative Zoölogy is an account by C. E. Hamlin, of the results of an examination of the Syrian molluscan fossils, chiefly from Mount Lebanon, collected by Dr. Merrill and Mrs. Bird. Of the twenty-

five Gastropoda, seventeen are new, and of the thirty Lamellibranchiata sixteen are new. The shells are from the Tertiary, Cretaceous and Jurassic.

BOTANY.[1]

Additional Notes on Passion Flowers.—The following notes and drawings of Passiflora, kindly furnished me by Professor Wm. Trelease, of Madison, Wis., are of interest, and should have appeared in connection with my paper on *Passiflora lutea* in the July Naturalist.—*Aug. F. Foerste, Granville, Ohio.*



Sections of passion flowers. 1.—*Passiflora gracilis.* 2.—*P. incarnata* (diagrammatic). *n*, nectar gland; *ng*, nectar guard; *c'*, inner corona; *c*, outer corona; *cor.*, corolla; *sep.*, sepals.

"*Passiflora gracilis.*—There is apparently good provision made for crossing, as nectar is secreted by the gland, but the stamens are reached by the very strongly recurved stigmas, so that close (self) pollination occurs about as soon as the flower opens. This results in fertilization, so that all flowers produce fruit. Close pollination, if it should not succeed in the above manner, is sure to occur, as the flowers close at night and so press anthers and stigmas together."[2] Bot. Gardens, Cambridge, Mass.

[1] Edited by Prof. C. E. Bessey, Ames, Iowa.

[2] This power of self-fertilization does not exclude crossing, which is provided for in the secretion of nectar and possibly by prepotency in the pollen of other flowers, if one may reason from the cases in which this peculiarity is demonstrable. As Mr. Henslow suggests (Trans. Linn. Soc., 2d ser., Bot., 1, p. 366) the greater necessity for self-fertility [in case crossing is not effected] here than in related species is to be found in the fact that *P. gracilis* is an annual.